



Missouri
Department of
Natural Resources

Missouri Department of Natural Resources
Regulatory Impact Report
In Preparation for Proposing
An Amendment to 10 CSR 20-7.031, Missouri Water Quality Standards

Division/Program: Division of Environmental Quality, Water Protection Program

Rule number: 10 CSR 20-7.031 **Rule title:** Water Quality Standards

Type of rule action: *Amendment to Existing Rule*

Nature of the rulemaking: *Affects environmental conditions, prescribes environmental standards, administrative, and other conditions*

Approval of the Completed Regulatory Impact Report:

John Madras

Program Director

11/9/12

Date

Missouri Department of Natural Resources
Regulatory Impact Report
In Preparation for Proposing
An Amendment to 10 CSR 20-7.031 Missouri Water Quality Standards

Applicability: Pursuant to Section 640.015 RSMo, “all rulemakings that prescribe environmental conditions or standards promulgated by the Department of Natural Resources...shall... be based on the Regulatory Impact Report...” This requirement shall not apply to emergency rulemakings pursuant to Section 536.025 or to rules of other applicable federal agencies adopted by the department “without variance.”

Determination: The department has determined this rulemaking prescribes environmental conditions or standards and verifies that this rulemaking is not a simple unvarying adoption of rules from other federal agencies. Accordingly, the department has produced this Regulatory Impact Report (RIR) which will be made publicly available for comment for a period of at least 60 days. Upon completion of the comment period, official responses will be developed and made available on the agency web page prior to filing the proposed rulemaking with the Secretary of State (SOS). Contact information is at the end of this RIR.

1. Description of the environmental conditions or standards being prescribed

This rulemaking includes revisions that ensure that state water quality standards (WQS) are functionally equivalent to federal standards and that improve the clarity, specificity and effectiveness of the WQS. In summary, the revisions include the following:

- a) **Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].**
The department is providing a recommendation that responds to the U.S. Environmental Protection Agency (EPA) request that Missouri expand its classification system to currently unclassified waters, or otherwise satisfy the rebuttable presumption of “fishable/swimmable” uses as required by Section 101(a) of the federal Clean Water Act (CWA). EPA notified the department of this deficiency by letter on September 8, 2000 following a previous triennial review. More recently, on February 16, 2012 federal court found that the water quality standards, as submitted in 2005, did not meet the requirements of the Clean Water Act.
- b) **Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].**
Use designations for the protection of aquatic life will be refined to support a tiered aquatic habitat protection framework based on data and information found in Missouri’s Aquatic Gap project. Tiered aquatic habitat protection uses will provide for better implementation and protection of aquatic habitat in rule. Additionally, the existing “Human Health Protection – Fish Consumption” use designation will be renamed to “Human Health Protection”.
- c) **Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** These changes are results from the last series of Use Attainability Analyses (UAAs) conducted in 2007 and

2008 that were either disapproved or required additional action following Missouri's 2009 WQS triennial review. This action would include adding whole body contact recreation (WBC) use to stream segments where this use is attainable or existing, designating secondary contact recreation (SCR) to stream segments where existing SCR uses were observed, and removing the WBC use on stream segments where this use is unattainable. These changes will be made to 10 CSR 20-7.031, Table H and in the geospatial dataset developed and maintained by the department.

- d) **Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where specific use designations were inadvertently removed during a previous rulemaking without sufficient justification or cause. Restoration of the irrigation (IRR) use to the Mississippi River (Water Body ID: 1707.03) and the drinking water supply (DWS) use to Prairie Home C.A. Lake (Water Body ID: 7444) will address a disapproval from EPA in its August 16, 2011 letter to the department regarding the 2009 WQS triennial review.
- e) **Updating reference to Missouri's Antidegradation Implementation Procedure.** This revision updates reference to Missouri's Antidegradation Implementation Procedure (AIP) at 10 CSR 20-7.031(3)(D) which was revised and approved by the Missouri Clean Water Commission May 2, 2012. The sole revision to the AIP reduces the 20% cumulative cap for in-stream degradation to 10%, a value supported by EPA in their July 2, 2009 and August 16, 2011 letters to the department on this issue. Adoption and reference to the approved AIP should satisfy EPA's concerns on the document and result in EPA approval for the procedure.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** This revision uses more accurate Geographic Information System (GIS) and geologic and hydrologic field survey data to refine the start and end point of this losing stream segment. This item was omitted from the last order of rulemaking due to lack of public participation and is included here by Clean Water Commission directive. These changes will be made to 10 CSR 20-7.031, Table J and in the geospatial dataset developed and maintained by the department.
- g) **Revised definitions and criteria relating to wetlands.** This revision updates references to wetlands delineation manuals published by the U.S. Army Corps of Engineers and improves the clarity of definitions for Class W waters at 10 CSR 20-7.031(1)(F)7 and Wetlands at 10 CSR 20-7.031(1)(BB). The revision also revises the criteria that apply to wetlands under the rule at 10 CSR 20-7.031(5)(A)5 and those criteria from 10 CSR 20-7.031, Table A that do not apply (i.e., dissolved oxygen, hydrogen sulfide, temperature and metals).
- h) **Revised delineation and mileages of water body segments.** These improvements use more accurate GIS data to refine the delineation of start and end points of water body segments and recalculate stream mileages. The improvements use data and information contained in the 1:100,000 and 1:24,000 National Hydrography Dataset (NHD) and Missouri's Aquatic Gap project.

2. Report on the peer-reviewed scientific data used to commence the rulemaking process

a) Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].

Through Missouri's Water Protection Forum, the department convened a stakeholder group to gather input and ideas regarding application of CWA Section 101(a) use designations to currently unclassified waters. The Water Classification Workgroup convened in September 2009 and held five workgroup meetings through April 2010. The workgroup considered all readily available and applicable peer-reviewed scientific data and posted results and information to the website listed below. The centerpiece of the use designation proposal (i.e., all perennial rivers and streams and intermittent streams with permanent pools and those waters spatially represented by the 1:100,000 scale NHD) arose from the Water Protection Forum and other stakeholder discussions. Due to unresolved issues regarding the spatial extent and implementation of the proposal, the department did not proceed with the default use designations in the WQS rule package that became effective June 30, 2012. Instead, the department reconvened the Water Classification Workgroup to address and resolve the issues that were problematic with the previous rule. In particular, the department wished to resolve any remaining issues regarding the spatial extent of the default use designation and to develop a structured, scientific method for determining use attainability for the aquatic life protection use. The reconvened Water Classification Workgroup, and its technical subcommittee, met a total of five times in the late spring and summer 2012. The workgroup and technical subcommittee were comprised of agricultural, municipal, industrial, and environmental stakeholders as well as state and federal wildlife and regulatory agencies. Information on the Water Classification Workgroup can be found on the web at the link below. <http://www.dnr.mo.gov/env/wpp/cwforum/adv-uncl-waters-wetlands.htm>

As a result of these additional meetings, the Water Classification Workgroup refined the previous proposal to include data and information developed through Missouri's Aquatic Gap project (Sowa et al, 2005). In addition to providing predictive modeling for aquatic life distributions for fish, crayfish and mussels, the data layers supporting the aquatic gap project filled gaps in the existing 1:100,000 scale NHD line work, allowing for more complete calculation of stream extent and entities affected by the rulemaking. The peer-reviewed and published data used in the development of the Missouri Aquatic Gap project can be found on the Missouri Resource Assessment Partnership (MORAP) website at the link below. These data and information were also used to develop a framework for tiered aquatic habitat protection through revised designated use definitions detailed in 2(b) below. <http://morap.missouri.edu/Projects.aspx?ProjectId=1>

b) Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].

Through the Water Protection Forum, the department convened a stakeholder group to gather input and ideas regarding revisions to use designation definitions found in rule. The proposed use designation definition framework arose from the Water Protection Forum and other stakeholder discussions that included agricultural, industry, municipal and environmental representatives. Examples from other state WQS were used as reference when drafting the use designation definitions being proposed. The draft rule language presented at the citation for this action was developed in cooperation with stakeholders as well as state and federal wildlife and regulatory agencies. Information on the Water Classification Workgroup can be found on the web at the link in 2(a) above.

- c) **Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** A UAA is a structured, scientific assessment of the factors affecting the attainment of the use, which may include physical, chemical, biological and economic factors. Each UAA contains information for assessing attainability of the WBC or SCR use. Relevant information included evidence of an existing WBC or SCR use and/or the measured depths of the water body in accordance with the “Missouri Recreational Use Attainability Analyses: Water Body Survey and Assessment Protocol, December 19, 2007”. The UAA data were evaluated by an Internal Review Committee composed of department staff. The collective recommendation of the committee was documented in an Internal Review Committee Recommendation. Persons can review the data gathered during the UAAs and the Internal Review Committee Recommendations on the department's UAA web page <http://dnr.mo.gov/env/wpp/wqstandards/uaa/index.html>.
- d) **Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were inadvertently removed without sufficient justification or cause. No additional peer-reviewed scientific data or use attainability analyses are necessary to restore these uses.
- e) **Updating reference to Missouri’s Antidegradation Implementation Procedure.** This revision updates reference to Missouri’s Antidegradation Implementation Procedure in rule. No additional peer-reviewed scientific data was necessary to update reference to the Missouri Clean Water Commission approved AIP.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** These revisions involve the use of GIS information and field data to clarify and correct water body segment identification and locations for Dry Fork Creek, Maries County in Table J of the WQS. The department’s Geological Survey Program conducted geologic and hydrologic evaluations of the stream segment to determine the extent and location of losing stream reaches. The GIS information and data used to revise losing stream segment delineation and mileages are peer-reviewed prior to publication and distribution.
- g) **Revised definitions and criteria relating to wetlands.** The U.S. Army Corps of Engineers developed regional supplements to its “Corps of Engineers Wetlands Delineation Manual (January 1987)” and made those supplements available to states for use in delineating wetlands within their jurisdictions. These supplemental manuals were subject to peer-review and comment prior to widespread usage in wetlands determinations. The peer-reviewed science and information used to develop these manuals are part of the administrative record for the individual supplements and contained by reference in those publications.

Water quality standards must contain use designations, criteria and antidegradation considerations for the waters that are protected. The addition of criteria for wetlands ensures the Class W and wetlands designations placed in rule receive full protection under the federal CWA. The exclusions from criteria are those pollutants that are known to exceed or not conform with specific criteria found in Table A of 10 CSR 20-7.031 due to naturally occurring conditions found in wetland environments. Application of criteria

to wetlands will ensure complete protection of these resources as directed by members of the Clean Water Commission at its May 2, 2012 meeting.

- h) Revised delineation and mileages of water body segments.** These revisions involve the use of GIS information and data to clarify or correct water body segment identifications within the WQS. The GIS information and data used to revise water body segment delineation and mileages is peer-reviewed prior to publication and distribution. No additional scientific analyses or data were used in making these revisions.

3. Description of the persons who will most likely be affected by the proposed rule, including persons that will bear the costs of the proposed rule and persons that will benefit from the proposed rule

- a) Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].** Missouri’s WQS currently contain approximately 25,025 miles of stream designated for CWA, Section 101(a) “fishable/swimmable” uses. The proposal to use the spatial extent of an enhanced 1:100,000 scale NHD would apply these default use designations to an additional 90,707 miles of stream (115,732 miles total). Refinements to the 1:100,000 scale NHD linework at the 1:24,000 scale may add additional stream miles to the above total due to increased resolution of the linework (i.e., incorporating accurate meanders and bends). The overall spatial extent of the 1:100,000 scale NHD, with the added enhanced network density in northwest and southwest Missouri offered by the aquatic gap project, will not change. The proposed rulemaking will also add approximately 2,120 lake class features to the WQS where these features intersect the 1:100,000 scale NHD spatial extent.

Point Sources

Domestic sewage treatment facilities that discharge to stream segments where WBC or SCR are designated may be affected by this rule. Some facilities may be exempt from disinfecting effluent because a UAA has demonstrated that the WBC use is not attainable and the facility can achieve effluent limits protective of SCR. Other facilities will be required to disinfect because either a UAA has not been conducted, or a UAA has demonstrated the attainability or existence of WBC use or SCR use in the receiving stream that requires disinfection. Domestic sewage treatment facilities that discharge to stream segments where aquatic life protection uses are designated may also be affected by this rule. These facilities have reasonable potential to exceed acute and chronic criteria for ammonia nitrogen and other toxic pollutants. Current permitting procedures require reasonable potential calculations per 40 CFR 122.44(d)1 to determine whether wastewater treatment facilities have reasonable potential to cause or contribute to violations of water quality standards. Domestic wastewater treatment facilities typically have reasonable potential to violate acute in-stream ammonia nitrogen criteria, requiring upgrades or operational modifications to the facility in order to achieve compliance with the acute water quality standard. The regulatory impact for existing domestic facilities to remove ammonia nitrogen to acute levels was estimated in previous regulatory impact reports as these criteria were adopted or modified. Ammonia nitrogen criteria were last revised in November 2005 to adopt federal criteria based upon EPA’s “1999 Update of Ambient Water Quality Criteria for Ammonia”. The current rulemaking does not affect

or impact these previous determinations. When metals or other toxics are found in facility effluent, limitations protective of chronic toxicity are included in facility operating permits where reasonable potential exists due to limited degradation and assimilation of these pollutants in the aquatic environment. The current rulemaking does not affect or impact these facilities and estimates of these costs have not been calculated.

Domestic wastewater typically contains ammonia nitrogen in concentrations that exceed chronic ammonia toxicity criteria. Current permit derivation procedures find reasonable potential exists in most cases to exceed chronic in-stream ammonia nitrogen criteria, even when allowances for degradation and ammonia decay are considered. As a result, many domestic wastewater treatment facilities are currently being required to upgrade or modify wastewater treatment processes to remove ammonia to chronic toxicity levels. These new ammonia requirements are under the WQS rule currently in effect, as revised in 2005 to adopt federal criteria, and an extension of “fishable” aquatic life protection uses to additional stream miles will not affect these facilities or the regulatory costs they will incur. Therefore, no changes stemming from ammonia nitrogen reasonable potential analyses for existing domestic facilities are anticipated as a result of this rule. However, due to concerns that the costs for ammonia removal at domestic facilities may not have been accurately estimated previously, and to update costs based on current methods of calculation, the costs for ammonia nitrogen removal at domestic facilities has been estimated and included in this report.

Nonpoint Sources

Nonpoint sources of bacteria include contributions from wildlife, surface runoff from urban environments, and agricultural runoff that includes waste associated with livestock production. Nonpoint source contributions may be controlled through incentive programs that promote Best Management Practices (BMPs) and environmental awareness. The U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS) and the department’s Soil and Water Conservation Program (SWCP) are major sponsors of this effort. The EPA and the department, through Section 319 nonpoint source pollution control grants, can also provide funding and expertise to reduce or eliminate bacteria from wildlife, livestock, and urban sources. To aid in determining state priorities for watershed-based improvement, the department launched the *Our Missouri Waters Initiative*. This initiative is an effort to move Missouri towards watershed-based management and will provide the framework for making decisions at the watershed scale. The initiative will also allow the department and watershed stakeholders to leverage the resources and expertise of local, state and federal agencies toward water quality improvements.

Because the extent and magnitude of nonpoint source driven bacteria impairments is not known, it is difficult to estimate the cost of voluntary, incentive-based BMPs that may be needed to restore or maintain recreational uses. It is also difficult to predict how much funding will be available at the state and federal level to sponsor BMPs and other projects that aim to reduce bacteria pollution from nonpoint sources. Ultimately, the success of voluntary incentive-based BMPs for bacteria and nutrient (i.e., ammonia) removal is based upon the level of participation and number of BMPs that may be implemented, a factor that is difficult to predict ahead of time. As the framework and opportunity for

water quality based trading is developed and implemented in Missouri, the ability to estimate the cost-benefit of nonpoint source BMPs may become easier to accomplish.

As with agricultural sources, runoff from urban sources is not regulated except in metropolitan areas covered by municipal separate storm sewer system (MS4) permits. Urban stormwater may contain significant amounts of bacteria from pet waste and wildlife. Educational and outreach programs work to improve pet care and wildlife management strategies that reduce bacteria loading from these sources. Storm water runoff from 152 municipalities in Missouri are required to manage their storm water under Phase II of the National Pollutant Discharge Elimination System (NPDES) MS4 permit program. Because bacteria data for receiving streams within the permitted area of these MS4s is lacking, the extent and impact of bacteria loading on these receiving streams is unknown.

Benefits

Persons benefiting from the rule amendment include all citizens of Missouri, as well as family, tourists and other visitors to the state, who enjoy recreational activities in and on the streams for which the rule amendment designates an aquatic life protection or recreational use. The bacteria standards that would apply to these designated waters would serve to protect the health and well-being of the persons recreating in the streams. In addition, the rule amendment may also result in economic benefits for those individuals and businesses that provide goods and services to those who recreate in and on these streams, including those who provide food, fuel, recreational equipment and other amenities.

- b) Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].** The proposed revisions to use designation definitions have no expected effect, monetarily or otherwise, on any person. The revisions to aquatic life use definitions transition the WQS from a sport fishery-based approach to a tiered aquatic habitat protection framework that will allow for better delineation and designation of Missouri's unique and diverse aquatic habitats. Because water quality criteria protective of aquatic life uses are based upon aquatic community toxicity data (i.e., fish, macroinvertebrate, and mussel), no adjustments to criteria will need to be made. The addition of an exceptional aquatic habitat definition will allow for greater recognition and protection of those waters with exceptional water quality or diversity of unique, sensitive, threatened or endangered species.
- c) Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** Domestic wastewater treatment facilities that discharge to stream segments where WBC and/or SCR use were evaluated through a UAA may be affected by this rule. Some facilities will be exempt from disinfecting effluent because the UAA demonstrated that the WBC use is not attainable and the SCR use does not exist in the receiving stream. Other facilities will be required to disinfect because the UAA demonstrated the attainability of WBC use or the existence of SCR use in the receiving stream.

Persons benefiting from the rule amendment include all citizens of Missouri, as well as family, tourists and other visitors to the state, who enjoy recreational activities in and on

the streams for which the rule amendment designates a recreational use. The bacteria standards that would apply to these designated waters would serve to protect the health and well-being of the persons recreating in these streams. In addition, the rule amendment may also result in economic benefits for those individuals and businesses that provide goods and services to those who recreate in and on these streams, including those who provide food, fuel, recreational equipment and other amenities.

- d) **Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. No Clean Water Act actions (permit, enforcement or otherwise) have occurred that may be affected by this revision since the department is precluded from using unapproved WQS by federal rule at 40 CFR 131.21 (aka the “Alaska Rule”).
- e) **Updating reference to Missouri’s Antidegradation Implementation Procedure.** The revision updates reference to Missouri’s Antidegradation Implementation Procedure (AIP) in rule as approved by the Missouri Clean Water Commission on May 2, 2012. No applicants or antidegradation reviews have utilized the disapproved cumulative cap provision found in the previous version of the AIP. No Clean Water Act actions (permit, enforcement or otherwise) have occurred that may be affected by this revision.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** The proposed rule revision will ensure that permits and water quality assessments are supported by an accurate losing stream table (10 CSR 20-7.031, Table J) and associated GIS data layer. Increased locational accuracy of losing streams reduces the potential for mistakes in the identification of applicable WQS and, consequently, for these errors to result in inappropriate permit limits and conditions or inaccurate water quality assessments. Avoiding these mistakes will save both time and resources for permit applicants and the department when preparing and reviewing permit applications.
- g) **Revised definitions and criteria relating to wetlands.** The proposed revisions incorporate by reference updated wetlands delineation manuals that are the state of the science in this field. Entities conducting wetland delineations or determinations use these manuals currently in the course of normal operations. No change in operation, or increase in cost, is expected as a result of incorporating updated wetland delineation manuals in rule.

The proposed revisions that apply numeric criteria to wetlands are not anticipated to affect permitted or other entities in the near term as no wetlands have been formally designated as Class W waters in rule. However, due to the proximal nature of wetlands to other waters of the state (i.e., streams and lakes), existing effluent limitations to protect aquatic life in these waters should be protective of the adjacent or proximal wetlands. No additional requirements for dischargers are anticipated beyond those already considered in 3(a) above.

- h) **Revised delineation and mileages of water body segments.** The proposed rule revisions will ensure that permits and water quality assessments are supported by an accurate water body segment delineation system. Increased locational accuracy of water

body segments reduces the potential for mistakes in the identification of applicable WQS and, consequently, for these errors to result in inappropriate permit limits and conditions or inaccurate water quality assessments. Avoiding these mistakes will save both time and resources for permit applicants and the department when preparing and reviewing permit applications.

4. Description of the environmental and economic costs and benefits of the proposed rule

a) Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].

The proposed revisions that apply “fishable/swimmable” use designations to currently unclassified waters is required by Section 101(a) of the federal CWA. Federal regulations at 40 CFR 131 interpret and implement these provisions by requiring that WQS provide for a default use designation of “fishable/swimmable” unless those uses have been shown through a UAA to be unattainable. As a delegated state responsible for implementing federal clean water law requirements, Missouri must adopt the federal requirement for “fishable/swimmable” use designations for waters that currently do not have these uses and for which a UAA has not been conducted. A February 16, 2012 federal court decision confirmed this deficiency in state rule and the need for Missouri to expand “fishable/swimmable” use designations to more waters. Therefore, the environmental and economic costs and benefits of these revisions are being determined by actions at the federal and not the state level.

Section 536, RSMo, does not require that cost and benefit analyses be conducted when federal requirements are adopted without modification. As written, the current proposal would implement federal requirements in state rule, but should be considered a modification of the federal requirement. This RIR has determined that 765 facilities may be affected by the revisions. As noted in Section 3(a) above, current facility operating permit procedures protect aquatic life to the chronic toxicity level for metals and toxics. No change is anticipated, or additional effluent limitations required, due to default designation of aquatic life protection uses for facilities discharging these pollutants. Additional effluent limitations for bacteria (i.e., *E. coli*) may be required due to default designation of recreational uses. Additional requirements for the removal of ammonia nitrogen may also be required, but the extent that these requirements will occur under the current (versus previous) rule revisions is difficult to determine. In this regard, the RIR has been developed to estimate and update any remaining costs that may be required for facilities that discharge this pollutant. A list of permitted facilities that may be required to have NPDES permits with limits for bacteria and ammonia is provided in Appendix A.

It is important to note that the number of facilities affected by the current rulemaking is less than those estimated in the June 3, 2011 RIR. The number of facilities affected by disinfection was reduced from 1,342 to the current estimate of 765. The spatial extent of the 1:100,000 NHD brings all domestic discharges to within two (2) miles of a stream designated for recreation. Therefore, all domestic discharges in the state will be required to disinfect their effluent, unless it has been demonstrated that the discharger can meet effluent limitations for bacteria without disinfecting, or it has been demonstrated through an approved UAA that the stream receiving the effluent does not support either WBC or

SCR. All other facilities covered by site-specific, general or storm water permits do not have reasonable potential to discharge bacteria and will be unaffected by this rulemaking.

Environmental Benefit: Environmental protection efforts are typically more cost effective and sustainable than efforts to restore aquatic resources that are degraded or impaired. Application of default “fishable/swimmable” use designations to currently unclassified waters will ensure these aquatic resources are afforded appropriate protection in rule. The main environmental benefit of this revision will be greater protection of these waters from degradation and maintenance of the ecosystems and economies that rely on them.

The designation of recreational uses to streams and, consequently, the application of a pathogen standard (*E. coli* as an indicator) may require disinfection of effluent before it is discharged to waters designated to this use. The application of the standard through discharge permits will provide greater protection of public health during recreational use. Persons who recreate in streams that have elevated levels of bacteria through runoff from areas containing livestock may also benefit from this rule. Recreational use designations may place a priority on the use of 319 grants and state/federal cost-share and incentive programs in reducing pathogen levels in streams serving recreational uses that may be of very high quality or impaired.

Environmental Cost: Environmental effects from the proposed use designations might come through the discharge of residual chlorine that may enter the receiving water from the disinfection process, unless dechlorination processes are required to meet total residual chlorine effluent limitations. Dechlorination may also introduce other contaminants, such as trihalomethanes, which may be carcinogenic. Where recreation does occur, the risks to human health from ingestion of disinfection by-products are significantly less severe than the risk of infection from non-treated effluent and the pathogens it contains. Where recreation does not occur, the addition of the by-products would be the greater risk of toxicity to the aquatic environment.

Economic Benefit: Economic benefits can be generated by environmental improvements. For example, areas where stream water quality is good and supporting beneficial uses, costs such as medical expenses to treat pollution-related illnesses can be prevented. Streams that support recreation are sometimes an important factor in a local economy, especially where recreation-related services such as lodging or fee-based camping, canoe or tube rental and food services are needed. An exact quantification of these benefits is not possible without more data on the number of recreational stream users, the illnesses that relate to pathogens already present in the water and the business income that results from the users during recreation. Because most of these streams do not show any evidence of existing recreation use and are small compared to the better known “float streams”, any benefits are likely to be only occasional and confined to users who live in the vicinity of the stream.

According to the Missouri Department of Conservation (MDC), Missourians have a strong interest (93%) in fish, forests and wildlife. These interests take many forms and can translate into economic benefits. According to the 2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation produced by the U.S. Fish and Wildlife

Service, preliminary estimates indicate that a total of \$665 million is spent on fishing alone annually in the state of Missouri. According to the study, twenty-three percent of the \$665 million originates from non-resident anglers, demonstrating the value of Missouri's aquatic resources in the tourism industry. As noted by MDC in a comment on the previous rulemaking, "the sustainability and quality of these public fisheries is directly dependent on the quality of the water in which the fish live." The economic benefit of tourism and associated industries that rely on water quality that supports robust fisheries cannot be ignored.

Economic Cost: Estimates of economic cost should be viewed in the context of overall wastewater infrastructure costs in Missouri. According to EPA's 2008 Clean Watersheds Needs Survey (CWNS), Missouri has documented needs totaling \$6.5 billion for wastewater treatment, storm water management and nonpoint source control needs. Of this total, wastewater treatment needs total approximately \$5.2 billion for wastewater treatment plant upgrades, pipe repair and replacement, recycled water distribution and combined sewer overflow correction. In 2008, 73 percent of Missouri residents received centralized wastewater treatment and 17 percent of the population is served by small community wastewater treatment systems (CWNS, 2008). Newer data collected under the 2012 CWNS will likely show current costs for wastewater infrastructure equal or exceed these previous estimates as communities gain greater understanding of their needs and responsibilities. A separate study of small communities (population < 5,000) conducted by the Missouri Association of Councils of Government (MACOG) found statewide infrastructure needs for 452 communities to be in excess of \$170 million. While individual estimates of cost for specific facilities in the MACOG study may vary from the costs estimated in this RIR, the trend and need for wastewater treatment capacity and upgrades is clear, especially for smaller communities that may not have the user or rate base to sustainably fund such improvements.

In many cases, infrastructure improvements and costs need not be expended all at once. Requirements for wastewater treatment plant upgrade and the costs associated with these activities can be implemented incrementally over time using compliance schedule and affordability provisions found in current and future rules. In addition, facility upgrades and costs can be deferred under 40 CFR 131.10(g)6 if significant socio-economic hardship is documented and demonstrated through the Use Attainability Analysis process. Lastly, new initiatives at the state and federal level to develop procedures that allow for incremental, cost-effective upgrades using compliance schedules, affordability provisions, long term control plans, and integrated planning should provide affected facilities the flexibility to spread costs out over time in a manner that is sustainable for both the community and the environment.

The number of domestic wastewater treatment facilities that will be required to add disinfection as a result of this rulemaking was obtained from the Missouri Clean Water Information System (MoCWIS). Domestic facilities without effluent limitations or schedules of compliance for disinfection were included in the analysis. Facilities that currently disinfect their effluent, have schedules of compliance to achieve disinfection of their effluent or were designed to be no-discharge facilities were not included in the analysis. In total, 658 domestic wastewater treatment facilities (247 publicly-owned, 411 privately-owned) may be required to disinfect their discharges or otherwise support

downstream recreational designated uses. Facilities required to disinfect their discharges may spend between \$18,191 to \$7,006,441 in capital construction costs depending on the size of their treatment system and the type of disinfection process installed. Annual operation and maintenance (O&M) costs for these facilities range between \$3,540 to \$177,971 depending on the size of the facility and the disinfection process chosen. Total capital construction costs for public and private facility disinfection is estimated to be between \$120,523,512 and \$560,497,177. Total O&M costs for public and private facility disinfection is estimated to be between \$3,853,599 and \$42,381,157 annually. Tables 4.1 and 4.2 present information regarding capital construction and O&M disinfection costs for both public and private domestic wastewater facilities, respectively. Cost estimates were derived using the department’s affordability estimation procedure for upgrading wastewater treatment systems. The software uses flow-based cost interpolation for design of chlorine and ultraviolet disinfection systems based upon EPA’s Computer Assisted Procedure for the Design and Evaluation of Wastewater Treatment Systems (CAPDET) system.

Table 4.1. Public Facility Costs for Disinfection by Design Flow (DF)

Facilities by DF	DF (MGD)	Capital Cost		Annual O&M		Total Low	Total High
		Low	High	Low	High		
112	DF ≤ 0.05	\$14,784,000	\$77,252,352	\$457,968	\$6,882,324	\$15,241,968	\$84,134,677
123	0.05 < DF ≤ 1	\$25,320,493	\$168,583,079	\$910,062	\$8,498,047	\$26,230,556	\$177,081,126
12	1 < DF ≤ 20	\$25,852,104	\$57,929,635	\$785,711	\$1,607,946	\$26,637,815	\$59,537,581
0	DF > 20	\$0	\$0	\$0	\$0	\$0	\$0
247		\$65,956,597	\$303,765,066	\$2,153,741	\$16,988,317	\$68,110,338	\$320,753,384

Table 4.2. Private Facility Costs for Disinfection by Design Flow (DF)

Facilities by DF	DF (MGD)	Capital Cost		Annual O&M		Total Low	Total High
		Low	High	Low	High		
393	DF ≤ 0.05	\$51,876,000	\$236,831,107	\$1,606,977	\$24,205,366	\$53,482,977	\$261,036,474
18	0.05 < DF ≤ 1	\$2,690,915	\$19,901,004	\$92,881	\$1,187,474	\$2,783,795	\$21,088,478
0	1 < DF ≤ 20	\$0	\$0	\$0	\$0	\$0	\$0
0	DF > 20	\$0	\$0	\$0	\$0	\$0	\$0
411		\$54,566,915	\$256,732,111	\$1,699,858	\$25,392,840	\$56,266,772	\$282,124,952

The number of domestic wastewater treatment facilities that will be required to remove ammonia nitrogen as a result of this and previous rulemakings was obtained from the department’s Missouri Clean Water Quality Information System (MoCWIS). Domestic facilities without effluent limitations or schedules of compliance for ammonia nitrogen were included in the analysis. Facilities that currently either remove ammonia from their effluent, have schedules of compliance to achieve removal of ammonia from their effluent, or were designed to be no-discharge facilities were not included in the analysis. In total, 645 domestic wastewater treatment facilities (212 publicly-owned, 433 privately-owned) will be required to remove ammonia from their discharges or otherwise support

downstream aquatic life protection uses. Facilities required to remove ammonia from their discharges may spend between \$19,591 to \$13,744,898 in capital construction costs depending on the size of their treatment system and the type of wastewater treatment process installed. Annual operation and maintenance (O&M) costs for these facilities ranges between \$5,939 to \$530,775 depending on the size of the facility and the wastewater treatment process chosen. Total capital construction costs for public and private facility ammonia removal is estimated to be between \$271,168,867 and \$582,412,543. Total O&M costs for public and private facility ammonia removal is estimated to be between \$32,485,421 and \$69,005,443 annually. Tables 4.3 and 4.4 present information regarding capital construction and O&M ammonia removal costs for both public and private domestic wastewater facilities, respectively. Cost estimates were derived using the department's affordability estimation procedure for upgrading wastewater treatment systems. The software uses flow-based cost interpolation for design of wastewater treatment systems based upon EPA's Computer Assisted Procedure for the Design and Evaluation of Wastewater Treatment Systems (CAPDET) system. The low and high cost estimates for capital construction costs consider four wastewater treatment technologies: 1) lagoon facility with additional aeration, 2) sequencing batch reactor (SBR) facility, 3) extended aeration facility, and 4) oxidation ditch.

Table 4.3. Public Facility Costs for Ammonia Treatment by Design Flow (DF)

Facilities by DF	DF (MGD)	Capital Cost		Annual O&M		Total Low	Total High
		Low	High	Low	High		
112	DF ≤ 0.05	\$45,725,270	\$86,714,607	\$5,891,169	\$11,083,922	\$51,616,438	\$97,798,529
99	0.05 < DF ≤ 1	\$81,287,557	\$221,882,194	\$9,902,654	\$14,821,234	\$91,190,210	\$236,703,428
1	1 < DF ≤ 20	\$9,854,542	\$13,744,898	\$342,939	\$530,775	\$10,197,481	\$14,275,673
0	DF > 20	\$0	\$0	\$0	\$0	\$0	\$0
212		\$136,867,368	\$322,341,699	\$16,136,761	\$26,435,931	\$153,004,129	\$348,777,631

Table 4.4. Private Facility Costs for Ammonia Treatment by Design Flow (DF)

Facilities by DF	DF (MGD)	Capital Cost		Annual O&M		Total Low	Total High
		Low	High	Low	High		
413	DF ≤ 0.05	\$121,486,002	\$226,217,919	\$14,587,522	\$40,062,582	\$136,073,524	\$266,280,501
20	0.05 < DF ≤ 1	\$12,815,497	\$33,852,926	\$1,761,138	\$2,506,930	\$14,576,635	\$36,359,856
0	1 < DF ≤ 20	\$0	\$0	\$0	\$0	\$0	\$0
0	DF > 20	\$0	\$0	\$0	\$0	\$0	\$0
433		\$134,301,499	\$260,070,844	\$16,348,660	\$42,569,512	\$150,650,159	\$302,640,356

These calculations assume all facilities not currently disinfecting will install disinfection when the discharge is within two (2) miles of a water body designated for recreational use. These calculations also assume all domestic facilities currently not removing ammonia nitrogen will have reasonable potential to cause or contribute to violations of water quality standards and require effluent limitations. These calculations do not take into account the cost to future facilities that do not presently have an operating permit.

- b) Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].** No significant economic and environmental costs or benefits are expected to result from the addition or revision of use designation definitions. These additions and revisions will result in better accuracy in the identification and designation of beneficial uses. This improved accuracy will increase the efficiency of program activities that require water body use designations. The increased efficiency should reduce costs for both the applicants and the department as water body segments will be appropriately protected through application of standards and permit limitations. The implementation of a tiered aquatic habitat protection framework should also ensure that aquatic habitats are protected to the level necessary to support the aquatic ecosystems existing or attainable in waters of the state.
- c) Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** These rule revisions add WBC use to 6 stream segments where the use is attainable and designates SCR to 14 stream segments where existing SCR uses were observed. The economic and environmental costs and benefits of recreational use designations as a result of UAAs are similar to those found in Response 4(a).

Table 4.5. EPA Disapproved Removal of Recreational Use Due to Attainability of SCR

WBID #	Water Body Name	Revised Recommendation	Basis for Recommendation
1220	Bear Cr.	Add SCR	Max depth = 0.9 m (2007 UAA)
0491	Campbell Cr.	Add SCR	Max depth = 0.8 m (2007 UAA)
0442	Hickory Cr.	Add SCR	Max depth = 0.5 m (2007 UAA)
1437	Lindley Cr.	Add SCR	Max depth = 0.9 m (2007 SES UAA) Max depth = 0.74 m (2007 MEC UAA)
2815	Pike Cr.	Add SCR	Max depth = 0.83 m (2007 UAA) Suburban neighborhood also noted.
3410	Reid Cr.	Add SCR	Max depth = 0.97 m (2007 UAA)
0382	Rollins Cr.	Add SCR	Max depth = 0.9 m (2005 UAA) Max depth = 0.75 m (2007 UAA)
0952	Scott Br.	Add SCR	Max depth = 0.65 m (2007 UAA)
1837	Trib. to Cape La Croix	Add SCR	Max depth = 0.8 m (2007 UAA)
0791	Trib. to Clark Fk.	Add SCR	Max depth = 0.5 m (2007 UAA)
0484	Trib. to Wildcat Cr.	Add SCR	Max depth = 0.5 m (2007 UAA)
3175	Truitt Cr.	Add SCR	Max depth = 0.9 m (2007 UAA)

Table 4.6. Other EPA Disapproved Removal of WBC

WBID #	Water Body Name	Revised Recommendation	Basis for Recommendation
3810	Douger Br.	Add WBC, Add SCR	Public Comment = SWIMMING, Playing, Wading (East of Hwy P) Max depth = 0.5 m (2007 UAA)
2771	Menorkenut Slough	Add WBC, Add SCR	Median depth = 0.55 m at 1 of 6 sites (2007 UAA) Max depth = 0.82 (2007 UAA)

WBID #	Water Body Name	Revised Recommendation	Basis for Recommendation
1156	Deberry Cr.	Add WBC	No UAA completed on this segment. UAA conducted on wrong classified segment (2007 UAA). Cannot rebut presumptive WBC use.
3707	St. Johns Ditch	Add WBC, Retain SCR	UAA notes drought conditions as Phase 2 drought. US Drought Monitor website shows this area between 9/18/2007 – 9/25/2007 to be in D2 Drought – Severe to D3 Drought - Extreme status. UAA conducted 9/19 – 9/21/2007. Due to drought status, cannot verify that stream was at baseflow conditions during UAA survey (2007 UAA). Additionally, the 2005 UAA was determined by the review committee to be inconclusive. For these reasons, the UAAs did not rebut the presumptive WBC use. Boat, foot paths, parks, playgrounds, ATV tracks observed during UAA survey. Max depth = 0.86 m. (2007 UAA)
3821	Modoc Cr.	Add WBC, Add SCR	No representative UAA was completed for this segment. Public comment cites fishing, wading, frogging and mushroom hunting from Hwy 94 down to Missouri R. (2007) Also, Max depth = 0.5 m (PRS 2007 UAA) and 0.76 m (DNR 2005 UAA).
0187	Coon Cr.	Add WBC, Add SCR	2006 UAA Max Depth = 1m 2008 UAA Max Depth met at 4/8 sites The 2005 and 2006 UAAs contain interviews that cite hunting, fishing and trapping uses on this stream. The 2006 UAA also notes that footprints were observed.
0505	Wamsley Cr.	Add WBC, Retain SCR	EPA received a comment that swimming occurs here. Public comments cite SCR uses on this stream. Also max depth = 0.8 m in 2008 UAA.

For those waters where SCR is being designated, but WBC is recommended to be removed, costs and impacts for disinfection were estimated in the 2005 WQS rulemaking RIR for WBC (RIR for Proposed Rule Amendment, 10 CSR 20-7.031, WQS, October 13, 2004). Due to the relaxation of bacteria standards for these water body segments, facilities affected by the proposed revisions may incur less or infrequent costs due to higher effluent limitations for bacteria. For the stream segments where the WBC use is being added (i.e., designated), potential costs and impacts for these facilities have already

been accounted for during the 2005 WQS rulemaking RIR when WBC was originally designated to these waters.

- d) **Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. No environmental or economic costs or benefits are anticipated in restoring previously designated uses to these waters. Any costs and benefits would have been determined under a previous rulemaking to establish the uses.
- e) **Updating reference to Missouri's Antidegradation Implementation Procedure.** No environmental or economic costs or benefits are anticipated in updating reference in the WQS to the May 2, 2012 Missouri Clean Water Commission approved AIP. To date, no applicants or antidegradation reviews have utilized the disapproved cumulative cap provision found in the previous version of the AIP. Therefore, no costs will be incurred to revisit or revise previously conducted antidegradation reviews.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** These rule revisions will result in better locational accuracy for the losing stream segments of Dry Fork Creek in Maries County. This improved accuracy will increase the efficiency of program activities that may require the use of the losing stream information (e.g., permits and water quality assessments). The increased efficiency should reduce costs for both permit applicants and the department and result in more accurate determinations for permits and water quality assessments.
- g) **Revised definitions and criteria relating to wetlands.** These rule revisions update reference to wetlands delineation manuals already in use by those practicing in the field. The updated delineation manuals will allow those conducting assessments to use the most up-to-date methods and practices for wetland determination and delineation, resulting in more accurate delineation of wetland areas. Accurate delineation of wetland areas will result in appropriate environmental protection of these waters and accurate mitigation requirements where these actions are necessary.

The proposed revisions to apply numeric criteria to wetlands are not anticipated to have environmental or economic costs or benefits in the near term as no wetlands have been formally designated as Class W waters in rule. Criteria applied to wetlands will ensure these waters have complete environmental protection and will be a benefit to protecting and preserving the designated uses of these aquatic resources. It is not anticipated that economic costs will be incurred by permitted entities above and beyond those already existing or anticipated for waters (i.e., streams and rivers) adjacent to or proximal to wetlands. Criteria applied to wetlands will ensure that the pollutant reducing capacity, aquatic and terrestrial habitat, and recreational opportunities provided by these aquatic resources are protected in rule.

- h) **Revised delineation and mileages of water body segments.** These rule revisions will result in better accuracy in the identification of lakes and streams. This improved accuracy will increase the efficiency of program activities that require the use of the water body delineation information (e.g., permits, water quality assessments, and total

maximum daily loads). The increased efficiency should reduce costs for both permit applicants and the department.

5. Probable costs to the agency and to any other agency of the implementation and enforcement of the proposed rule and any anticipated effect on state revenue

a) Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].

Missouri's WQS regulations currently contain approximately 25,025 miles of stream designated for CWA, Section 101(a) "fishable/swimmable" uses. The proposal to use an enhanced 1:100,000 scale NHD would apply these default use designations to an additional 90,707 miles of stream (115,732 miles total). According to the 2010 Missouri Water Quality Report (Section 305(b) Report), the department spends about \$3.3 million annually on monitoring and analysis of ambient water and related media. Monitored waters are those waters for which sufficient water quality data for an assessment has been collected in the past five years. Approximately 27 percent of all classified stream miles and 81 percent of all classified lake acres are considered to be monitored during any given assessment cycle. To consider all currently classified waters monitored for assessment purposes translates into a cost to the department of approximately \$19.8 million over a roughly six year period. The 4.6-fold increase in the amount of waters to be monitored and assessed would not result in any significant economies of scale for the department. Therefore, in order to achieve a similar percentage of waters monitored on future water quality reports, the department's annual monitoring and analysis costs would increase to \$15.2 million. Resource allocations less than this amount would necessarily result in a smaller percentage of waters being monitored and assessed over the assessment cycle. Estimates of monitoring and assessment only consider probable costs to the Department of Natural Resources and does not include estimates of probable costs to other state and federal agencies whose data the department uses for assessment and regulatory purposes.

The proposed revisions would not change the department process for the review of permit applications. Staff would perform reasonable potential analyses and calculate wasteload allocations for water quality-based effluent limits in the same manner as done currently. Bacteria effluent limitations will be added to permits where these limits are required, and will be documented in the permit fact sheet or statement of basis as is current practice. Therefore, no increased costs to the department with respect to permitting are expected from this proposed rule.

b) Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].

The proposed rule revision will lead to more accurate and clear delineations of aquatic habitat use designations. Establishing accurate use designations ensures the appropriate application of criteria and can eliminate unnecessary regulatory steps and delays in determining effluent limits for permits. Improvement in use designations will increase the accuracy and certainty of regulatory decisions by the department for permitting, enforcement, water quality assessment and development of total maximum daily loads. Increased accuracy and certainty will improve efficiencies in these processes, reducing costs for the department, other state and federal agencies, the regulated community and the public.

- c) **Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** It is unlikely that the proposed changes to use designations will add any significant work or cost to the department or to any other agency. Establishing accurate use designations will ensure appropriate application of criteria and eliminate unnecessary regulatory steps and delays in determining effluent limits for permits.
- d) **Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. No costs to the department or other agencies are expected as these uses were inappropriately modified and no known regulatory actions have been taken on the unapproved standards.
- e) **Updating reference to Missouri’s Antidegradation Implementation Procedure.** This revision updates reference to Missouri’s Antidegradation Implementation Procedure in rule. No costs to the department or other agencies are expected as this rule revision merely updates a reference to a Clean Water Commission approved document.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** The proposed rule revisions should lead to more consistent and clear delineation of the losing stream segments of Dry Fork Creek in Maries County. These improvements will result in increased work efficiency and a reduction of costs for the department.
- g) **Revised definitions and criteria relating to wetlands.** The proposed revision to incorporate updated wetlands delineation manuals in rule will lead to more accurate delineations of wetlands in the state. Because these manuals are currently being used for wetlands activities in the state, no costs to the department or other agencies are expected as a result of updating these references in rule.

The proposed revisions to apply numeric criteria to wetlands may result in additional monitoring costs to the state to determine compliance with applicable wetland criteria. However, the extent and cost of this monitoring is unknown due to the lack of designated wetlands in the current rule. It is anticipated that any future monitoring of wetlands will be included in the department’s overall monitoring program and prioritized as funding is available.

- h) **Revised delineation and mileages of water body segments.** The proposed rule revisions should lead to more consistent and clear delineations of water bodies in the state and lead to increases in work efficiency and a reduction of costs for the department.

6. **Comparison of the probable costs and benefits of the proposed rule to the probable costs and benefits of inaction, which includes both economic and environmental costs and benefits**

One of this state’s greatest natural resources is its abundant water. The WQS regulations are designed to protect that resource. If this rulemaking does not become effective, some of

those resources will not be protected to the extent required by federal law. Many of these impacts are immeasurable in terms of costs simply because the exact effects from lack of action are incalculable. While the potential economic cost explained in Section 4 of this report may be significant for portions of the rulemaking, no comparison can be made to environmental benefits without associating a cost to lowered health of citizens and the diminished resources that this rulemaking is intended to prevent.

The state of the economy depends to some extent on the state of the environment. For example, an area that can advertise good water quality is attractive to many human activities, from tourism to industry. Investments in infrastructure to meet regulatory requirements can also be a benefit to public and private facilities that wish to improve capacity or customer service. Improved infrastructure can attract additional industry and customers which, over time, can help subsidize and repay any costs incurred for the improvements.

a) Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].

The costs and benefits of this proposed rule are discussed in Responses 4(a) and 5(a). Costs are generally associated with pollution control activities including disinfection and ammonia removal systems for point sources and best management practices for nonpoint sources. The capital improvement costs and average yearly cost for operating and maintaining disinfection and ammonia removal systems at domestic wastewater treatment systems, which are the most prevalent point source for these pollutants, are shown in Tables 4.1 through 4.4. The cost of inaction (i.e. not requiring disinfection or ammonia removal) would likely be seen in health care costs associated with illnesses attributable to pathogens in the wastewater that are discharged to the streams supporting recreation and reduced aquatic communities capable of supporting recreational fishing. These costs are difficult to ascertain. Records are not available to indicate the number of people who contract illnesses while recreating in streams receiving effluent that has not been disinfected. Therefore, this report is unable to make a comparison between this potential health care cost and the costs associated with disinfection. However, this report does observe that the costs associated with requiring disinfection to protect streams designated to WBC by this rule is a new cost, whereas, the health care cost that would be attributable to not designating the use, and consequently not requiring disinfection, is a current cost. It is also difficult to estimate the costs associated with reductions in recreational fishing opportunities due to reduced aquatic communities impacted by ammonia nitrogen.

If, due to inaction on the part of the state to implement this rule, EPA takes action to promulgate “fishable/swimmable” use designations in Missouri, this will lead to a high degree of uncertainty. It is likely EPA would simply promulgate a rule that places “fishable/swimmable” designations on “all waters of the United States.” Because the definition of what constitutes “all waters of the United States” is in flux, there will be a lack of clarity over which waters are included.

b) Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].

Because the proposed revisions are a clarification of the existing rule, no costs are expected to be created by this action. Some savings may be expected in that the revisions may prevent confusion in the rule's interpretation. Inaction may result in insufficient protection of aquatic communities and a lack of flexibility in designating waters to subcategories of a designated use where appropriate.

- c) **Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** The costs and benefits of this proposed rule revision are discussed in Responses 4(a) and 5(a). Costs are generally associated with pollution control activities including disinfection systems for point sources and BMPs for nonpoint sources. The average yearly cost for operating disinfection systems at domestic wastewater treatment systems, which are the most prevalent point source for bacteria pollution, is shown in Tables 4.1 and 4.2. The cost of inaction (i.e. not requiring disinfection) would likely be seen in health care costs associated with illnesses attributable to pathogens in the wastewater that are discharged to the streams supporting recreation. This cost is difficult to ascertain. Records are not available to indicate the number of people who contract illnesses while recreating in streams receiving effluent that is not disinfected. Therefore, this report is unable to make a comparison between this potential health care cost and the costs associated with disinfection. However, this report does observe that the costs associated with requiring disinfection to protect streams designated to WBC by this rule is a new cost, whereas, the health care cost that would be attributable to not designating the use, and consequently not requiring disinfection, is a current cost.
- d) **Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. Inaction on the part of the department to restore the removed designations will result in federal action to restore the designations. Department staff and legal costs to respond to a federal filing will be greater than if the department responds now to correct these errors.
- e) **Updating reference to Missouri's Antidegradation Implementation Procedure.** This revision updates the WQS to reference an approved procedure, allowing the department and others to use the document for Clean Water Act purposes. Inaction would leave the department unable to implement antidegradation water quality standards currently found in rule through the permit process. The inability to effectively implement antidegradation policies and procedures would be a significant program deficiency, one which EPA would consider during future program delegation reviews.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** Because the proposed revisions only clarify the existing losing stream segments in the current rule, no costs are expected to be created by this action. Some savings may be expected to result and the revision should eliminate confusion in locating the losing stream segment for Clean Water Act purposes.
- g) **Revised definitions and criteria relating to wetlands.** The revisions to update references in state rule to current wetlands delineation manuals will allow the department and others to use the document for Clean Water Act purposes. Inaction would leave the department unable to implement wetland delineations using the most recent delineation manuals and science. The inability to effectively implement wetland delineations would result in inaccurate delineations of wetlands and be either under- or overprotective in nature with regard to both wetlands protection and mitigation. Under-protection of wetland areas and mitigation would have negative environmental and economic impacts

as wetland areas are beneficial in reducing pollutant loads, providing habitat for aquatic and terrestrial life, and providing opportunities for recreation (hunting, fishing, photography, nature viewing, etc.). Overprotection of wetland areas and mitigation may lead to increased costs for compliance with very little environmental benefit in return.

In addition to designated uses and antidegradation requirements, waters of the state must have criteria to ensure adequate and appropriate protection of the resource. Inaction by the state to apply specific criteria to wetlands will leave the department unable to implement wetland protections in the state and vulnerable to federal promulgation in this regard. The proposed applicable and non-applicable numeric criteria are a crucial first step in the protection of these unique resources.

- h) Revised delineation and mileages of water body segments.** Because the proposed revisions only clarify the existing water body delineation in the current rule, no costs are expected to be created by this action. Some savings may be expected to result and the revisions should eliminate confusion in locating and using the water body segments for Clean Water Act purposes.

7. Determination of whether there are less costly or less intrusive methods for achieving the proposed rule

Regional organizations, county governments, or municipal governments could enact laws or policies that provide similar or greater protection of water resources within their jurisdiction. This has been done in a few select areas of the state, but does not provide adequate protection for the entire state population or its water resources. As a result, statewide action through rulemaking is required for these items. EPA requires a regulatory program to ensure the effective administration of clean water standards. No other state agency has the authority or funding source to administer such a program. EPA has delegated its authority only to the department for administering a water quality program, and that delegation hinges on the program being functionally equivalent to the federal CWA.

- a) Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].** The centerpiece of the current use designation proposal (i.e., all perennial rivers and streams and intermittent streams with permanent pools and those waters spatially represented by an enhanced 1:100,000 scale NHD) arose from the Water Protection Forum and other stakeholder discussions. The proposal was developed through the stakeholder process to be the least costly and least intrusive means for achieving compliance with the “fishable/swimmable” requirement of the CWA and the federal court decision regarding Missouri’s deficiency in establishing and protecting these uses on a larger scale.

If, due to inaction on the part of the state to implement this rule, EPA takes action to promulgate “fishable/swimmable” use designations in Missouri, this will lead to a high degree of uncertainty. It is likely EPA would simply promulgate a rule that places “fishable/swimmable” designations on “all waters of the United States.” Because the definition of what constitutes “all waters of the United States” is in flux, there will be a lack of clarity over which waters are included.

- b) **Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].** This revision does not create new requirements or any costs. The purpose of the revision is to improve the clarity of the rule. Therefore, it should not result in any change in the cost of compliance and should lessen any potential for confusion regarding the implementation of the rule.
- c) **Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** A UAA is required in order to rebut the presumption that WBC can be attained in the targeted waters. Missouri currently has only one protocol for performing recreational UAAs, “Missouri Recreational Use Attainability Analyses: Water Body Survey and Assessment Protocol, Missouri Department of Natural Resources, Division of Environmental Quality, Water Protection Program, December 19, 2007.” Therefore, the methods chosen are the only methods available to achieve the proposed rule. Less costly and less intrusive means for conducting UAAs may not be structurally or scientifically sufficient to meet the burden of proof necessary to comply with federal regulations at 40 CFR 131.10(g).
- d) **Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. This revision does not create new requirements or any costs since it restores currently unapproved use designations to previously approved designations. The purpose of the revision is to restore the accuracy of the rule and no less costly or intrusive methods are applicable or available.
- e) **Updating reference to Missouri’s Antidegradation Implementation Procedure.** This revision updates reference to Missouri’s Antidegradation Implementation Procedure (AIP) in rule. The revision does not create new requirements or costs since it incorporates by reference an already approved document. No other less costly or intrusive option exists to achieve the objective of the revision.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** These revisions do not impose any new costs nor do they require significant changes in efforts to achieve compliance. Therefore, no other less costly or intrusive option exists to achieve the objective of the revisions.
- g) **Revised definitions and criteria relating to wetlands.** The revision to incorporate by reference updated wetlands delineation manuals does not create new requirements or costs and reflects the current state of the science. No other less costly or intrusive option exists to achieve the objective of the revisions.

The proposed revisions that apply numeric criteria to wetlands do not impose any new costs or requirements above those requirements already in place, or proposed to be in place, for discharges to streams and lakes. In conjunction with narrative (general) criteria, specific criteria will ensure that wetland resources are appropriately protected in rule. These revisions will also ensure state wetland protections are in compliance with the federal Clean Water Act. State water quality standards for wetlands will be incorporated into the Missouri’s Wetland Protection Program currently under

development. No other less costly or intrusive option exists to achieve the protections anticipated by these revisions.

- h) Revised delineation and mileages of water body segments.** These revisions do not impose any new costs on dischargers nor do they require significant changes in efforts to achieve compliance. Therefore, no other less costly or intrusive option exists to achieve the objective of this revision.

8. Description of any alternative method for achieving the purpose of the proposed rule that were seriously considered by the Department and the reasons why they were rejected in favor of the proposed rule

For most water quality rules, EPA guidelines and guidance offer the only current rationale for the selection of the proposed standards and the department defers to EPA's rationale for the science used in developing the standards. In order to establish standards other than those contained in EPA's guidelines and guidance, the state would need to provide rationale that is equally thorough and pervasive. Such an effort could take years and enormous resources, and would likely not lead to standards any different than those developed by EPA.

a) Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].

Two alternatives were considered by the stakeholder group and department prior to selecting the proposed extent. The first alternative proposed to apply default "fishable/swimmable" use designations to all waters of the state as defined in rule. Stakeholders from agricultural, industrial and municipal groups contended that the "waters of the state" extent was too broad and would extend protections beyond the limit required by Section 101(a) of the CWA. From a department perspective, no readily available GIS database exists that would allow for efficient implementation and administration of newly added waters of the state. Without a GIS database capturing all waters of the state, the spatial extent of the designation was unknown. Also, the lack of structured, tiered aquatic habitat protection use designations in rule limited the department's ability to set appropriate use designations and criteria to the large number of headwater and ephemeral streams that would be incorporated into rule. Appropriate use designations are necessary to ensure appropriate protection of those designated uses that exist or are attainable in headwaters and ephemeral streams.

The second alternative proposed to apply default "fishable/swimmable" use designations to the 1:24,000 scale NHD. Designation of default uses to the 1:24,000 scale NHD would add an additional 158,565 miles of stream (183,591 miles total) to the existing water body network. Stakeholders from agricultural, industrial and municipal groups again contended that the extent of default use designation would be too broad and extend protections beyond the limit required. Aquatic community data from the department and MDC appeared to substantiate this contention to some degree, where aquatic life was not as abundant on 1:24,000 scale NHD as opposed to 1:100,000 scale NHD waters. From a department perspective, a readily available GIS database exists from which efficient implementation and administration of newly added waters could occur. Although the 1:24,000 scale NHD database is more complete and more readily available than the 1:100,000 scale NHD layer, the uncertainty to which aquatic communities exist on

1:24,000 scale NHD waters weighed strongly against using the linework as a default designation. Because an aquatic habitat protection UAA protocol is proposed to accompany the rulemaking, waters that do contain aquatic life, but reside on the 1:24,000 scale NHD, can easily be added to the classified network as the need arises.

From an economic perspective, all permitted facilities discharge within 2 miles of the enhanced 1:100,000 scale NHD dataset and no significant difference in cost exists for any facility between the 1:24,000 or 1:100,000 scale NHD. From an environmental perspective, protections of aquatic habitat and recreational uses would be the same since all facilities are currently permitted to the chronic toxicity level and all domestic facilities would be required to disinfect and remove ammonia. Additional burden with respect to monitoring and assessment may be incurred by the department at the 1:24,000 scale NHD scale as it constitutes an additional 73,720 miles of stream that would need monitoring. If the current annual percentage of waters monitored is extended to the 1:24,000 scale NHD, annual monitoring costs would increase to \$24.9 million.

Ultimately, the enhanced 1:100,000 scale NHD proposal was advanced through the stakeholder group into the proposed rule because of the following: (1) certainty of aquatic communities on the spatial extent of the enhanced 1:100,000 scale NHD due to data and information contained in Missouri's Aquatic Gap project and data collected by the department and MDC, (2) an aquatic habitat protection UAA protocol would be available to add or remove waters from the rule, and (3) support from the regulated community that the proposal represents an appropriate extent for extending "fishable/swimmable" protections required by Section 101(a) of the CWA. Additionally, EPA has indicated in stakeholder meetings the current proposal meets the minimum requirements of the CWA and would be a good "first step" in extending CWA protections to more Missouri waters.

- b) Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].**
The purpose of the use designation revisions is to improve the clarity of the rule and provide greater flexibility in the designation and protection of aquatic habitat. The added flexibility to designate waters as warm, cool, cold, modified and exceptional aquatic habitat are alternatives not currently found in rule. Any other method of making these clarifications would not directly address the problem or provide a permanent solution.
- c) Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** A UAA is required in order to rebut the presumption that WBC can be attained and Missouri currently has only one protocol for performing recreational UAAs. Therefore, the methods chosen are the only methods available to achieve the proposed rule revisions.
- d) Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. Since the department does not have UAA data to support the removal of these uses, the method chosen to restore the erroneously removed uses is the only method available to satisfy the requirements of EPA and the rule.

- e) **Updating reference to Missouri's Antidegradation Implementation Procedure.** Because the department does not have an alternate AIP approved by the Commission, the method chosen to reference the most recently approved AIP is the only method available to satisfy the requirements of EPA and the rule.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** The department relies on geologic and hydrologic field surveys to delineate the location and extent of losing stream segments. These field surveys are then extrapolated onto paper or electronic maps and the boundaries of losing segments determined in terms of legal descriptions. This method of water body delineation and measurement is relatively inaccurate and may lead to either an under-application or over-application of the losing stream extent and criteria. The proposed revisions to Dry Fork Creek will eliminate these potential problems by using more accurate GIS and field data to achieve the proposed rule revisions.
- g) **Revised definitions and criteria relating to wetlands.** In the absence of its own documents or guidance, the department relies on other federal or state agencies to develop guidance and methods for determining appropriate environmental conditions. Incorporating by reference the most current and widely used wetlands delineation manuals will allow the department and others to use the most up to date science and guidance available. Therefore, the method chosen to reference the most recent and widely used wetlands delineation manuals is the only method readily available to satisfy the requirements of EPA and the rule.

In the absence of site-specific criteria for wetlands, the department will rely on the existing criteria found in rule to protect wetlands in the state. However, the department recognizes that not all criteria found in rule will be appropriate for assessing or determining attainment of wetland uses. For this reason, the proposed rule specifically excludes some criteria that may be difficult or impossible to attain due to the unique biology, hydrology and chemistry found in wetland systems. The method chosen represents the most reasonable path forward for wetland protection that will satisfy the requirements of EPA and a directive by the Commission that wetlands be protected with this rulemaking.

- h) **Revised delineation and mileages of water body segments.** The department has previously extrapolated the location and extent of water bodies from paper maps and reported their boundaries in terms of legal descriptions. This method of water body delineation and measurement is relatively inaccurate and may lead to either an under-application or over-application of the beneficial uses and criteria to waters covered by this rule. The proposed revisions will eliminate these potential problems by using more accurate GIS and field data to achieve the proposed rule revisions.

9. Analysis of both short-term and long-term consequences of the proposed rule

- a) **Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].** The short term consequence of the proposed rule is a change in permit limits and conditions for domestic wastewater treatment facilities that discharge to, or within 2

miles of, the enhanced 1:100,000 scale NHD streams or lakes. New permit conditions will establish a regulatory requirement for achieving bacteria standards in the receiving water. Some of these permits will contain schedules of compliance to design, build and operate a disinfection system. While reasonable potential to exceed ammonia nitrogen criteria likely exists at all domestic wastewater treatment facilities currently, the expansion of the water body system under the proposed rule will all but ensure reasonable potential exists in most, if not all, cases. It is difficult to ascertain which facilities under the current and proposed rule might not have reasonable potential due to site-specific conditions. Therefore, schedules of compliance for ammonia removal to protect in-stream aquatic communities will likely also be expected in the short term for all domestic facilities. The long-term consequence is the annual operation and maintenance (O&M) costs associated with wastewater treatment and the improved protection of public health during recreational use of the streams affected by this rule.

From a department perspective, the short-term and the long-term consequences of this rule are resource management related to ensure streams and lakes affected by this rulemaking are protected through regular monitoring and assessment of their water quality. In addition, while in the short term the department may satisfy the minimum requirements of “fishable/swimmable” use designations, future triennial reviews will need to revisit existing and effective rule language, as well as applicable federal guidance and court decisions, to increase use designations to that required under the federal CWA. Therefore, incomplete designations will be a long-term consequence requiring the department to revisit this issue during future triennial reviews.

While not specifically asked under this question, the proposed rule will have short- and long-term benefits to human health and the environment. These benefits are described in greater detail in sections 3(a) and 4(b) of this report.

- b) Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].** The proposed rule amendment revises and adds use designation definitions to allow for accurate and appropriate use designations and protection. The short-term and long-term consequences of the proposed rule amendment are the same and will afford appropriate protection of aquatic habitat without incurring unnecessary costs to the regulated community.
- c) Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** The short-term consequence of the proposed rule is a change in permit limits and conditions for bacteria in permits discharging to the targeted streams. The new permit conditions will establish a regulatory requirement for achieving the new bacteria standards. Some of these permits will contain schedules of compliance to design, build and operate a disinfection system. The long-term consequence is the annual O&M cost associated with wastewater treatment and the improved protection of public health during recreational use of the streams affected by this rule.
- d) Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. The short and long term consequences

of the proposed revisions are the same in that it restores erroneously removed designated uses and eliminates the risk of federal promulgation to remedy the erroneous removals.

- e) **Updating reference to Missouri's Antidegradation Implementation Procedure.** The revision updates reference to Missouri's Antidegradation Implementation Procedure (AIP) at 10 CSR 20-7.031(3)(D). The short and long term consequences of the proposed revision are the same as it provides the department and others with a Missouri Clean Water Commission approved AIP that can be formally submitted to EPA for use and approval of future permitting and antidegradation decisions.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** The proposed rule amendments will improve the identification of the losing stream segments of Dry Fork Creek in Maries County, making it easier to track the various types of information relative to each water body, such as the standards that apply, the status of water quality, the discharges affecting the water body, etc. These losing stream identifications are essential to decisions relating to effluent limitations, compliance determinations and water quality restoration activities.
- g) **Revised definitions and criteria relating to wetlands.** The updated reference to current wetlands delineation manuals will provide the department and others with reliable, up to date means for accurately delineating wetlands in both the short and long term. The consequences of not doing so would be inaccurate or erroneous wetland delineations that may be under or over protective with regard to wetland areas and mitigation. The short and long term consequences of application of criteria to wetlands are that appropriate protections will be afforded to these unique resources. Schedules of compliance to meet specific criteria protective of nearby streams or lakes will be sufficiently protective of wetlands in most cases. Details regarding the costs of under or overprotection of wetland resources are detailed previously in this report.
- h) **Revised delineation and mileages of water body segments.** The proposed rule revisions will improve the identification of water body segments, making it easier to track the various types of information relative to each water body, such as the standards that apply, the status of water quality, the discharges affecting the water body, etc. These identifications are essential to decisions relating to effluent limitations, compliance determinations and water quality restoration activities.

10. Explanation of the risks to human health, public welfare or the environment addressed by the proposed rule

Section 4 of this report details some of the risks that may exist should water quality not be protected by the new water quality standards proposed by this rulemaking. Because the department is adopting federal standards for CWA Section 101(a) use designations, further information on risk assessment may be obtained by reviewing the administrative record created during EPA's development of their technical guidelines for those uses as well as pollutant-specific guidelines for bacteria and ammonia. Application of numeric criteria for wetlands increases protections for these resources in rule, thereby reducing the risk that these resources would be adversely affected.

a) Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].

The designation of aquatic habitat and human health protection uses to perennial rivers and streams, intermittent streams with permanent pools and streams spatially represented by an enhanced 1:100,000 scale NHD recognizes the existing or potential use of these surface waters by aquatic life and humans. The application of numeric criteria (i.e., acute and chronic toxicity criteria), general criteria and antidegradation requirements to these waters protects the aquatic environment and the species that reside there. Protection of the aquatic environment and support for aquatic habitat protection uses enhances the environment and public welfare by providing opportunities for recreation, education, scientific research and protection and propagation of native and recreationally important fish species. A corollary of protection of the aquatic environment and recreationally important fish species is protection of human health for humans that consume fish, other aquatic life and water from these streams. The lack of aquatic habitat protection through appropriate use designation may irreparably damage or harm these resources to the potential detriment of human health and the environment.

The designation of recreational uses to surface waters recognizes the existing or potential contact people have with these waters. The application of pathogen criteria to these waters protects human health from the risk of gastrointestinal illness in waters designated for recreation. The presence of *E. coli* bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other animals. This form of contamination may introduce pathogens or disease-producing bacteria or viruses. Some waterborne pathogenic diseases include typhoid fever, viral and bacterial gastroenteritis and hepatitis A. The presence of fecal contamination is an indicator that a potential health risk exists for individuals exposed to this water. Fecal coliform bacteria may occur in ambient water as a result of the overflow of domestic sewage or nonpoint sources of human and animal waste. The protection of recreational uses in these waters will significantly reduce any human health concerns due to pathogenic infection.

b) Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].

The purpose of these revisions is to improve the clarity of the rule with regard to use designations. Its intent is to lessen any potential for confusion regarding the implementation of the rule. It does not address any risks to public health, welfare or the environment.

c) Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.

The designation of recreational uses to surface waters recognizes the existing or potential contact people have with these waters. The application of pathogen criteria to these waters protects human health from the risk of gastrointestinal illness in water bodies designated for recreation. The presence of *E. coli* bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other animals. This form of contamination may introduce pathogens or disease-producing bacteria or viruses. Some waterborne pathogenic diseases include typhoid fever, viral and bacterial gastroenteritis and hepatitis A. The presence of fecal contamination is an indicator that a potential health risk exists for individuals exposed to this water. Fecal coliform bacteria

may occur in ambient water as a result of the overflow of domestic sewage or nonpoint sources of human and animal waste.

- d) **Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. Erroneous removal of these designated uses presented potential risk to the irrigation and drinking water supply uses for these waters. The restoration of these designated uses will ensure there is no risk to human health, public welfare or the environment.
- e) **Updating reference to Missouri's Antidegradation Implementation Procedure.** The revision updates reference to Missouri's Antidegradation Implementation Procedure in rule. Including reference to the Missouri Clean Water Commission approved AIP will ensure that antidegradation requirements found in rule are upheld. As a result, unnecessary or unacceptable risks to human health, public welfare and the environment will be minimized.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** The purpose of the revisions is to improve the accuracy and clarity of the rule. This change did not significantly affect any risks to public health, welfare or the environment.
- g) **Revised definitions and criteria relating to wetlands.** The purpose of the revisions is to improve the accuracy of wetland delineations using the most up-to-date manuals and ensure complete protection of wetlands in rule. Addition of language referencing updated wetlands delineation manuals and providing criteria for wetland protection will ensure that risks to human health, public welfare and the environment are minimized.
- h) **Revised delineation and mileages of water body segments.** The purpose of the revisions is to improve the accuracy and clarity of the rule. This change did not significantly affect any risks to public health, welfare or the environment.

11. Identification of the sources of scientific information used in evaluating the risk and a summary of such information

Section 2 and Appendix A of this report present information that was used in the development of the proposed rule. Because the department is adopting federal standards for CWA Section 101(a) use designations, further information on risk assessment may be obtained by reviewing the administrative record created during EPA's development of their technical guidelines for those uses. In these cases, the department defers to the science used in the national studies for evaluating the risks to aquatic life and human health.

- a) **Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].** The designation of aquatic habitat, human health and recreational protections as required by Section 101(a) of the CWA recognizes the existing or potential use of these surface waters by aquatic life and humans. Subsequent sections of the CWA provide the tools necessary to perform the risk assessments and testing necessary to ensure the goals of the CWA are met. As detailed in CWA Section 304(a)(1)(A), the CWA provides for

development of water quality criteria that accurately reflects the latest scientific knowledge “on the kind and extent of all identifiable effects on health and welfare including, but not limited to, plankton, fish, shellfish, wildlife, plant life, shore lines, beaches, aesthetics, and recreation which may be expected from the presence of pollutants in any body of water”. In protecting waters for “fishable/swimmable” uses and developing criteria to protect those uses, the CWA promotes and provides the regulatory framework for identifying and minimizing risks to human health, public welfare and the environment.

- b) **Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].** The purpose of these revisions is to improve the clarity of the rule with regard to use designations. Its intent is to lessen any potential for confusion regarding the implementation of the rule. It does not affect any risks to public health, welfare or the environment.
- c) **Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** A number of studies have shown that public health is protected when the pathogen levels in recreational waters are controlled. Appropriate designation of WBC and SCR through the UAA process ensures public health is protected and risk of pathogen exposure is reduced where recreational uses are existing or attainable.
- d) **Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. Restoration of previously designated uses should not require additional scientific information to evaluate risk, since the level of protection previously designated is being restored and an unacceptable level of risk eliminated.
- e) **Updating reference to Missouri’s Antidegradation Implementation Procedure.** In adopting an Antidegradation Implementation Procedure on May 2, 2012 that aligns the cumulative cap provision with current regulatory requirements, the Missouri Clean Water Commission approved an AIP that provides the regulatory framework for minimizing risks to human health, public welfare and the environment.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** The purpose of the revisions is to improve the accuracy and clarity of the rule. This change did not significantly affect any risks to public health, welfare or the environment.
- g) **Revised definitions and criteria relating to wetlands.** The purpose of the revisions is to improve the accuracy of wetland delineations using the most up-to-date manuals and ensure complete protection of wetlands in rule. Addition of language referencing updated wetlands delineation manuals and providing criteria for wetland protection will ensure that risks to human health, public welfare and the environment are minimized for these waters.

- h) Revised delineation and mileages of water body segments.** The purpose of the revisions is to improve the accuracy and clarity of the rule. This change did not significantly affect any risks to public health, welfare or the environment.

12. Description and impact statement of any uncertainties and assumptions made in conducting the analysis on the resulting risk estimate

Because the department is adopting federal standards for portions of this rulemaking, further information on risk assessment may be obtained by reviewing the administrative record created during EPA's development of their technical guidelines and guidance. Providing information on uncertainties and assumptions would require an analysis of the preamble to the federal rule and it is uncertain that EPA documented all of the uncertainties and assumptions involved in their rule development.

- a) Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].** In protecting waters for "fishable/swimmable" uses and developing criteria to protect those uses, the CWA promotes and provides the regulatory framework for identifying and minimizing risks to human health, public welfare and the environment. The designation of aquatic habitat, human health and recreational protections as required by Section 101(a) of the CWA recognizes the existing or potential use of these surface waters by aquatic life and humans. Under the CWA, "fishable/swimmable" uses must be extended to all waters of the United States, the extent of which has been the subject of controversy and litigation for over a decade. Supreme Court cases such as *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers (SWANCC)* and *Rapanos v. United States (Rapanos)* have led to EPA and the U.S. Army Corps of Engineers developing guidance for CWA practitioners on interpreting the extent of waters of the United States. The document, "*Draft Guidance on Identifying Waters Protected by the CWA*" was out for public comment until July 31, 2011 and has not yet been finalized.

The EPA and U.S. Army Corps of Engineers guidance does not establish a linkage between waters of the United States and any one specific spatial extent or map scale. Rather, the guidance endeavors to be consistent with the established Supreme Court cases and supported by the agencies' scientific understanding of how water bodies and watersheds function. From the standpoint of the proposed rule's application of CWA Section 101(a) use designations to an enhanced 1:100,000 scale NHD, there is some uncertainty and an assumption that aquatic habitat and recreational uses are attainable at this spatial scale. Biological data and information collected by the department and MDC suggest that aquatic communities exist on streams spatially represented by the 1:100,000 scale NHD extent and that attainability and existing use at this scale is more certain than at other scales (e.g., 1:24,000 scale NHD). Predictive modeling of fish, crayfish and mussels found in Missouri's Aquatic Gap project appear to substantiate and support these data for aquatic life use attainment at the spatial scale of the 1:100,000 NHD. However, stream morphology suggests that recreational use for whole body contact recreation (i.e., swimming) is not as abundant on streams spatially represented by the 1:100,000 scale NHD extent, which may represent the upper end of attainability for that use. While the enhanced 1:100,000 scale NHD captures a significant percentage of streams, rivers and lakes that constitute waters of the United States, future rulemaking efforts shall endeavor

to include additional waters that meet established guidance or regulations on the matter. In addition, waters with existing or attainable aquatic habitat or recreational uses that do not fall within the proposed spatial extent of the 1:100,000 scale NHD will receive those designations as existing uses. Streams and rivers that are perennially flowing or intermittently flowing with permanent pools will also receive “fishable/swimmable” aquatic habitat use designations under the proposed rule.

- b) Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].** The purpose of the revision is to improve the clarity of the rule with regard to use designations. It does not affect any risks to public health, welfare or the environment. Therefore, no uncertainties exist with respect to the revision.
- c) Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** Uncertainties concerning the UAA process and procedures are minimal. Intensive stream morphology measurements, interviews, and a robust public participation process ensure adequate data are collected to determine existing and/or attainable recreational uses. Any assumptions that must be made are conservative and are intended to minimize any risk to human health.
- d) Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. Restoration of these uses will address disapprovals from EPA in its August 16, 2011 letter to the department regarding the 2009 WQS triennial review. No uncertainties or assumptions exist with respect to these revisions since the department is restoring previous determinations in the rule.
- e) Updating reference to Missouri’s Antidegradation Implementation Procedure.** This revision updates reference to Missouri’s Antidegradation Implementation Procedure approved by the Missouri Clean Water Commission May 2, 2012. No uncertainties or assumptions exist with respect to this revision as it is a simple update of a reference to a previously approved procedure.
- f) Revised delineation and mileages of Dry Fork Creek, Maries County.** The purpose of the revisions is to improve the accuracy and clarity of the rule. This change did not significantly affect any risks to public health, welfare or the environment. No uncertainties or assumptions exist with respect to these revisions.
- g) Revised definitions and criteria relating to wetlands.** The purpose of the revision is to improve the accuracy of wetland delineations using the most up-to-date manuals and ensure complete protection of wetlands in rule. The revisions will ensure that risks to human health, public welfare and the environment are minimized for these waters. No uncertainties or assumptions exist with respect to these revisions.
- h) Revised delineation and mileages of water body segments.** The purpose of the revisions is to improve the accuracy and clarity of the rule. This change did not significantly affect any risks to public health, welfare or the environment. No uncertainties or assumptions exist with respect to these revisions.

13. Description of any significant countervailing risks that may be caused by the proposed rule

a) Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].

The proposed designation of CWA Section 101(a) “fishable/swimmable” uses to currently unclassified waters will require a significant number of existing domestic wastewater treatment facilities to disinfect their effluent. Disinfection through chlorination can produce other harmful byproducts, such as trihalomethanes. Trihalomethanes are harmful to human health if consumed through drinking water supplies and may be carcinogenic. Where recreation does occur, the risks to human health from the by-products are less severe than the risk of infection from non-treated effluent. Where recreation does not occur, the addition of the by-products would be the greater risk to the environment. Disinfection of effluent through chlorination may also result in residual chlorine that is harmful and toxic to aquatic life. Dechlorination of the effluent may be required to reduce the amount of total residual chlorine to levels protective of aquatic communities. Chlorine is also a dangerous and explosive chemical that requires safe handling and storage practices at the facility.

Because discharges of treated effluent are prohibited directly above public drinking water supply intakes, this risk will only be posed where discharges are to losing streams that have a hydrologic connection to private wells and where sufficient treatment of the drinking water source is not provided. The department is unable to determine the number of instances where this risk may exist. However, the department will assess for this risk at the time a discharge permit is requested and may require alternative means to disinfection, such as UV light, to eliminate the potential for introducing trihalomethanes into groundwater or drinking waters supplies.

Ammonia removal from domestic wastewater treatment facility effluent can result in increased availability of nitrogen at rates typically greater than those found in the aquatic environment. An increase in available nitrogen to streams and lakes can lead to increased production of algae, the growth and decomposition of which can lead to aesthetic issues and lowered dissolved oxygen concentrations.

b) Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].

There are no significant countervailing risks associated with making the clarifications proposed by this revision.

c) Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses. There are no significant countervailing risks associated with the proposed rule specific to this section.

Environmental effects might come from the recommended use designations through the discharge of disinfection by-products when chlorination is used as the disinfection process. Some residual chlorine may enter the receiving water from the disinfection process unless dechlorination processes are required. Dechlorination may also introduce other contaminants, such as trihalomethanes, which may be carcinogenic. Where recreation does occur, the risks to human health from the by-products are less severe than the risk of infection from non-treated effluent. Where recreation does not occur, the addition of the by-products would be the greater risk to the environment.

- d) **Changes to use designations for specific water body segments.** Since these revisions simply restore use designations that were inadvertently removed, and no known regulatory actions have taken place that may have been affected by the change, there are no significant countervailing risks associated with this change.
- e) **Updating reference to Missouri’s Antidegradation Implementation Procedure.** The proposed revision updates the WQS to reference a recently approved AIP, allowing the department and others to use the document for Clean Water Act purposes. There are no significant countervailing risks associated with this change in reference. To the contrary, without this change the risk to water quality may be significant as the department would not have approved antidegradation procedures in place.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County.** There are no significant countervailing risks associated with the proposed rule specific to this section.
- g) **Revised definitions and criteria relating to wetlands.** The proposed revisions update the rule to provide current, up-to-date reference to wetlands delineation manuals and provide numeric criteria for the protection of wetlands. There are no significant countervailing risks associated with updating reference to the wetlands delineation manuals or providing numeric criteria for the protection of wetlands. To the contrary, the risk to water quality for wetlands would be significant as the department would not have approved criteria in place for these waters. To ensure appropriate protection of these waters, the department has provided exclusions from select criteria to address those circumstances where natural biological, chemical or hydrologic conditions may be attaining designated uses but are assessed higher than criteria values.
- h) **Revised delineation and mileages of water body segments.** There are no significant countervailing risks associated with the proposed rule specific to this section.

14. Identification of at least one, if any, alternative regulatory approaches that will produce comparable human health, public welfare or environmental outcomes

In most cases, the purpose of the proposed revision or addition is to make Missouri’s WQS regulation at 10 CSR 20-7.031 functionally equivalent to federal standards. Because federal technical guidance was available in most cases, and development of state specific alternatives can be resource intensive, no other approaches or alternatives were considered. However, persons who believe another approach is available, and can be supported by sufficient rationale, are encouraged to submit an explanation of the alternative approach to the department during the public comment period on the proposed rule.

- a) **Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)].** Missouri’s WQS regulation must be functionally equivalent to federal standards. In the case of CWA Section 101(a) use designations, “fishable/swimmable” uses must apply to all waters of the United States. Alternative regulatory approaches to the current proposal to designate “fishable/swimmable” uses to an enhanced 1:100,000 scale NHD were considered during stakeholder and department discussions. Alternative spatial extents

through which to apply these use designations include the 1:24,000 scale NHD, all waters of the state, or all waters of the United States. Designation of “fishable/swimmable” uses to these spatial extents would produce comparable human health, public welfare and environmental outcomes. However, the attainability of “fishable/swimmable” uses using these alternative approaches is unknown and their application and implementation could potentially be resource intensive for the department (see Response 8a). For these reasons, the current proposal to designate “fishable/swimmable” uses to an enhanced 1:100,000 scale NHD was selected.

- b) **Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)].** The department has not identified any alternative regulatory approaches that would produce comparable results to the clarification proposed by this revision. Inaction would lead to greater confusion and potential misapplication of the rule.
- c) **Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.** Changes to whole body contact recreation (i.e., “swimmable”) use designations must be accompanied by a UAA per 40 CFR 131.10(g). The department has not identified any alternative regulatory approaches that would produce comparable results to the proposed changes in recreational use designations.
- d) **Changes to use designations for specific water body segments.** The department is restoring use designations for two water body segments where designations were removed without sufficient justification or cause. Without additional data or information to justify the designated use removal, the department has no alternative regulatory approach that would allow the use removals to persist in rule.
- e) **Updating reference to Missouri’s Antidegradation Implementation Procedure.** This revision updates reference to Missouri’s Antidegradation Implementation Procedure to be consistent and functionally equivalent to federal antidegradation requirements. The department has not identified any alternative regulatory approach that would allow for approval of the AIP by EPA.
- f) **Revised delineation and mileages of Dry Fork Creek, Maries County [10 CSR 20-7.031, Table J].** The department has not identified any alternative regulatory approaches that would produce comparable results to the proposed revisions.
- g) **Revised definitions and criteria relating to wetlands.** The department has not identified any alternative regulatory approaches that would produce comparable results to the proposed revisions. The updating of wetland delineation manuals to the currently used technical documents is an improvement to the program until newer documents supersede those referenced. The inclusion of wetlands criteria will ensure protection of these resources in rule without being overprotective of criteria that may normally be exceeded in a fully functional wetland environment.
- h) **Revised delineation and mileages of water body segments.** The department has not identified any alternative regulatory approaches that would produce comparable results to the proposed revisions.

15. Information on how to provide comments on the RIR during the 60-day period before the proposed rule is filed with the SOS

Regulatory Impact Reports for current rule developments of the Water Pollution Control Branch may be found on the Water Protection Program Rule Development web page: <http://www.dnr.mo.gov/env/wpp/rules/wpp-rule-dev.htm>.

The comment period for this RIR is planned for November 23, 2012 through January 22, 2013. Comments can be submitted by e-mail to John Hoke, john.hoke@dnr.mo.gov. Comments may also be sent by mail to:

John Hoke
Missouri Department of Natural Resources
Water Protection Program
P.O. Box 176
Jefferson City, Missouri 65102-0176

After publication in the *Missouri Register*, there will be another opportunity for public input during the open comment period and public hearing related to the proposed rulemaking prior to rule adoption.

16. Information on how to request a copy of comments or the web information where the comments will be located

Comments received may be viewed on the Water Protection Program Rule Development web page at <http://www.dnr.mo.gov/env/wpp/rules/wpp-rule-dev.htm>. Copies of these comments may also be requested directly from the program by e-mail from John Hoke, john.hoke@dnr.mo.gov or by telephone: (573) 751-7428.

Appendix A – Technical Documents and Data Used in Developing Proposed Rule

General Rulemaking Documents

1. Missouri Revised Statutes, Chapter 536 – Administrative Procedure and Review.
<http://www.moga.mo.gov/statutes/c536.htm>
2. Missouri Rulemaking Manual, Missouri Secretary of State.
<http://www.sos.mo.gov/adrules/manual/manual.asp>
3. Federal Clean Water Act.
<http://epw.senate.gov/water.pdf>
4. Missouri Clean Water Law – Chapter 640.
<http://www.moga.mo.gov/statutes/c640.htm>
5. Missouri Clean Water Law – Chapter 644.
<http://www.moga.mo.gov/statutes/c644.htm>
6. *Proposed Amendment to 10 CSR 20-7.031, Water Quality Standards – Nov. 23, 2012*, Missouri Department of Natural Resources.
7. Environmental Protection Agency letter to Missouri Department of Natural Resources, regarding Missouri’s 2009 Water Quality Standards submittal, Aug. 16, 2011.

Clean Water Act Section 101(a) use designations [10 CSR 20-7.031(2)(A) – (G)]:

8. *Water Classification Workgroup Agendas*, Missouri Water Protection Forum, Missouri Department of Natural Resources; Nov. 15, 2012. Documents and information presented during these meetings are incorporated by reference and can be found at:
<http://dnr.mo.gov/env/wpp/cwforum/adv-uncl-waters-wetlands.htm>
9. Environmental Protection Agency letter to Missouri Department of Natural Resources, regarding Missouri’s 1994 and 1996 Water Quality Standards submittals; Sept. 8, 2000.
10. *Document 64 Order, Missouri Coalition for the Environment Foundation v. Lisa P. Jackson and the United States Environmental Protection Agency, Case No. 10-04169-CV-C-NKL*, Feb. 16, 2012.
11. *Document 65 Judgment, Missouri Coalition for the Environment Foundation v. Lisa P. Jackson and the United States Environmental Protection Agency, Case No. 10-04169-CV-C-NKL*, Feb. 16, 2012.
12. Sowa, S. P., D. D. Diamond, R. Abbitt, G. Annis, T. Gordon, M. E. Morey, G. R. Sorensen, and D. True, 2005. *A Gap Analysis for Riverine Ecosystems of Missouri. Final Report*, submitted to the USGS National Gap Analysis Program. 1675 pp.

13. *1999 Update of Ambient Water Quality Criteria for Ammonia, EPA-822-R-99-014*, United States Environmental Protection Agency, Dec. 1999.
14. *Total Ammonia Nitrogen Criteria Implementation Guidance*, Missouri Department of Natural Resources; Aug. 9, 2007.
15. Section 319 Nonpoint Source Pollution Control Grants, United States Environmental Protection Agency, <http://water.epa.gov/polwaste/nps/cwact.cfm>
16. Section 319 Nonpoint Source Pollution Control Grants, Missouri Department of Natural Resources, <http://dnr.mo.gov/env/wpp/nps/index.html>
17. *Our Missouri Waters Initiative*, Missouri Department of Natural Resources, <http://dnr.mo.gov/omwi.htm>
18. *Missouri's Phase I and Phase II Stormwater Communities, Revised Oct. 8, 2012*, Missouri Department of Natural Resources.
19. *2010 Missouri Water Quality Report (Section 305(b) Report)*, Missouri Department of Natural Resources; Nov. 9, 2010.
20. *Regulatory Impact Report, 10 CSR 20-7.031 Water Quality Standards, June 3, 2011*, Missouri Department of Natural Resources.
21. *2012 Triennial Review of Water Quality Standards – Regulatory Impact Report Comments*, Missouri Department of Conservation; Aug. 2, 2011.
22. *2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, State Overview*, United States Fish & Wildlife Service, Sept. 2012.
23. *Missouri Clean Watersheds Needs Survey 2008, State Fact Sheet*, United States Environmental Protection Agency, March 2010.
24. *State of Missouri 604(b) Statewide Wastewater Assessment*, Missouri Association of Councils of Government, July 2011.
25. Spreadsheet, Missouri Clean Water Information System (MoCWIS) and CAPDET cost estimate calculations, Missouri Department of Natural Resources, Aug. 30, 2012.
26. *Draft Guidance on Identifying Waters Protected by the Clean Water Act*, United States Environmental Protection Agency and United States Army Corps of Engineers, April 2011.
27. Map –*Classified Waters, Water Quality Standards Effective Oct. 30, 2009*, Missouri Department of Natural Resources, Nov. 4, 2010.

28. Map – *Enhanced 1:100,000-scale streams*, Missouri Department of Natural Resources, Nov. 20, 2012.
29. Map – *Enhanced 1:100,000-scale lakes and reservoirs*, Missouri Department of Natural Resources, Nov. 20, 2012.

Changes to Clean Water Act use designation definitions [10 CSR 20-7.031(1)(C)]:

30. *Water Classification Workgroup Agendas*, Missouri Water Protection Forum, Missouri Department of Natural Resources, Nov. 15, 2012. Documents and information presented during these meetings are incorporated by reference and can be found at: <http://dnr.mo.gov/env/wpp/cwforum/adv-uncl-waters-wetlands.htm>
31. Presentation, *Tiered Aquatic Life Use Framework, Water Classification Workgroup*, Missouri Department of Natural Resources, July 17, 2012.
32. Sowa, S. P., D. D. Diamond, R. Abbitt, G. Annis, T. Gordon, M. E. Morey, G. R. Sorensen, and D. True, 2005. *A Gap Analysis for Riverine Ecosystems of Missouri. Final Report*, submitted to the USGS National Gap Analysis Program, 1675 pp.

Changes to the designation of Whole Body Contact Recreation and Secondary Contact Recreation as a result of Use Attainability Analyses.

33. *2009 WQS Triennial Review – EPA recreational use change disapprovals and Revised recommendations for interim rulemaking*, Missouri Department of Natural Resources, Nov. 20, 2012. In addition to the document referenced above, specific Use Attainability Analysis (UAA) documents and information can be found on the UAA web page at the following link: <http://www.dnr.mo.gov/env/wpp/wqstandards/uaa/index.html>
34. *Missouri Recreational Use Attainability Analyses: Water Body Survey and Assessment Protocol, Dec. 19, 2007*, Missouri Department of Natural Resources.
35. *Regulatory Impact Report for Proposed Rule Amendment 10 CSR 20-7.031 Water Quality Standards*, Missouri Department of Natural Resources; Feb. 5, 2010, Missouri Department of Natural Resources.

Changes to use designations for specific water body segments.

36. Environmental Protection Agency letter to Missouri Department of Natural Resources, regarding Missouri's 2009 Water Quality Standards submittal; Aug. 16, 2011.

Updating reference to Missouri's Antidegradation Implementation Procedure.

37. *Missouri Antidegradation Implementation Procedure, May 2, 2012*, Missouri Department of Natural Resources.

Revised delineation and mileages of Dry Fork Creek, Maries County.

38. Letter, *Request for Reclassifying Portion of Dry Fork Creek, Maries County*, from Kingsford Manufacturing Company, Belle, MO, to Missouri Department of Natural Resources, March 31, 2010.
39. Letter, *Request for Change to Table J in Missouri's Water Quality Standards*, from Missouri Department of Natural Resources to Kingsford Manufacturing Company, Belle, MO, Aug. 24, 2010.
40. Memo, *Dry Fork Losing Stream Description in Table J and Kingsford comments*, Missouri Department of Natural Resources, Feb. 14, 2012.

Revised definitions and criteria relating to wetlands.

41. Environmental Laboratory. (1987). *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS.
42. U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0)*, ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-20. Vicksburg, MS: U.S. Army Engineer Research and Development Center.
43. U.S. Army Corps of Engineers. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region Version 2.0*, ed. J. F. Berkowitz, J. S. Wakeley, R. W. Lichvar, C. V. Noble. ERDC/EL TR-12-9. Vicksburg, MS, U.S. Army Corps of Engineers Research and Development Center.
44. U. S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)*, ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-16. Vicksburg, MS, U.S. Army Corps of Engineers Research and Development Center.

Revised delineation and mileages of water body segments.

45. MoCWIS Report, *Summary of Proposed Revisions – Table G*, Missouri Department of Natural Resources, Aug. 29, 2012.

46. MoCWIS Report, *Summary of Proposed Revisions – Table H*, Missouri Department of Natural Resources, Aug. 20, 2012.